Integration, Optimization & Support for the Community

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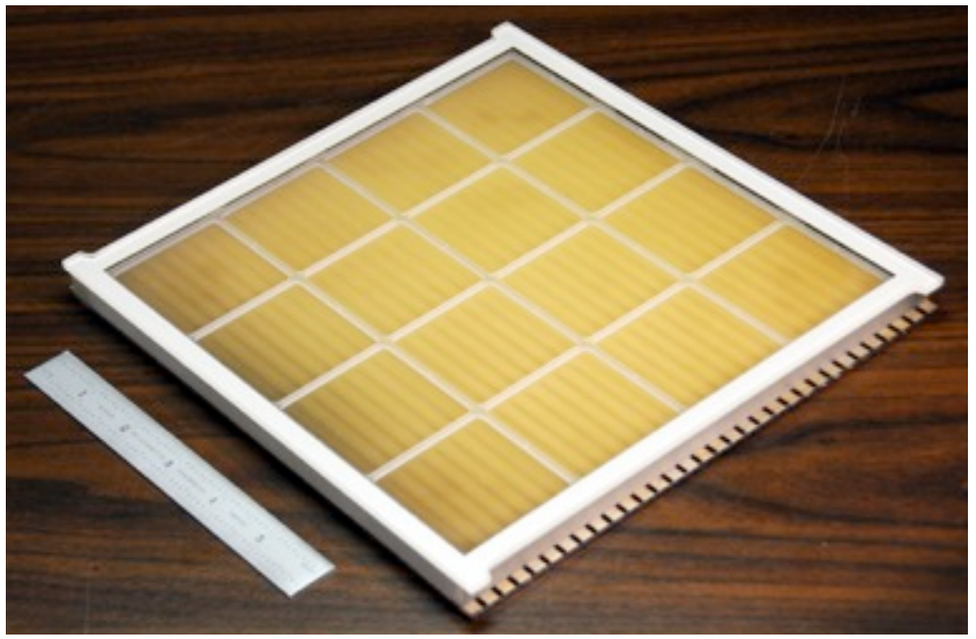
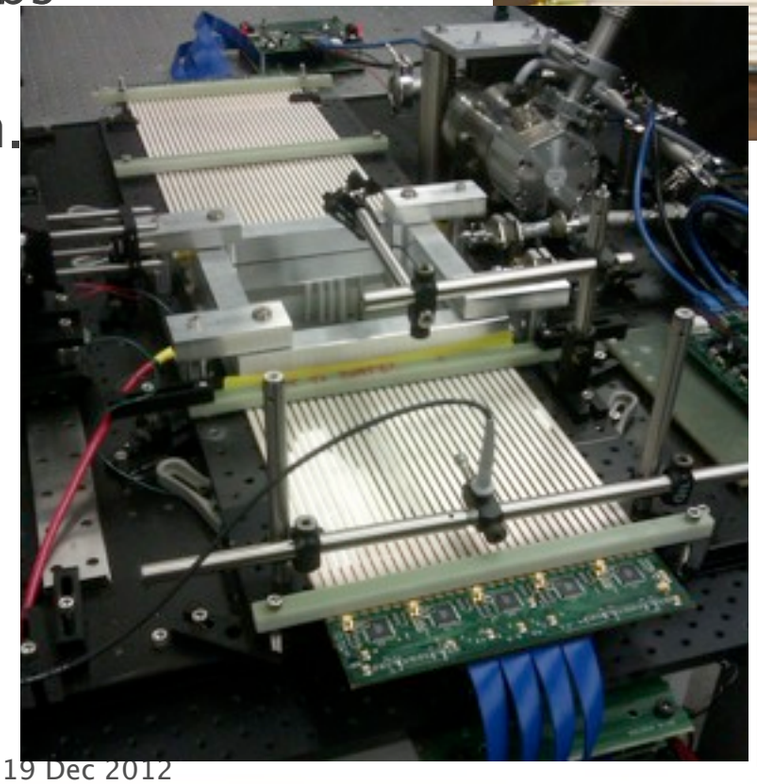
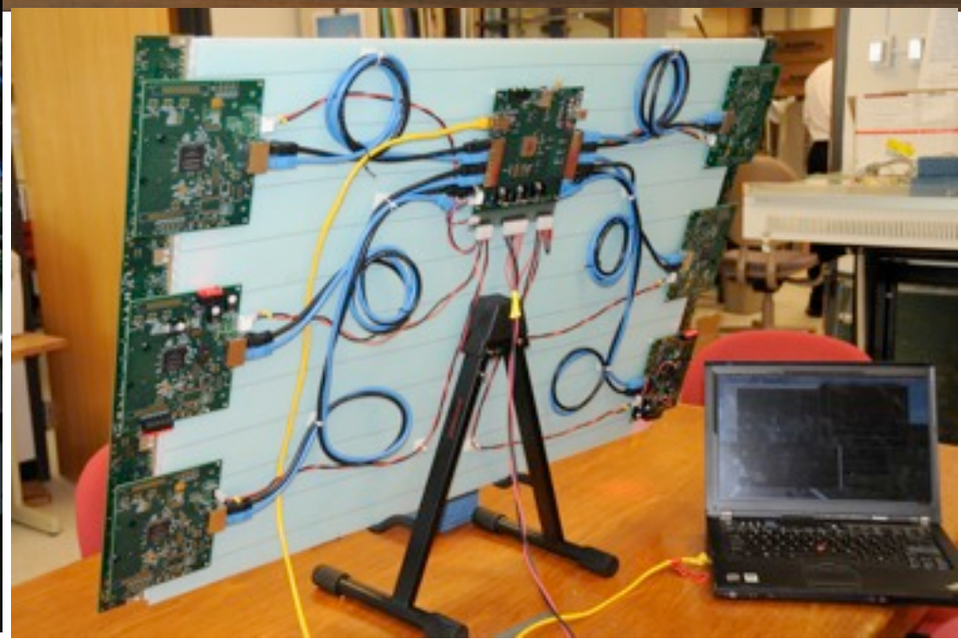
Wednesday 19 Dec 2012

Integration

- Turning tubes into systems
  - Tube – sealed detector with HV and anode strip, no connectors
  - Instrumentation with ground plane, analog card, digital card, central control
- Turning systems into useful field systems
  - software/firmware for custom readout electronics
  - calibration of ASIC, tile system
- on-site support for first adopters
  - rôle to be filled by labs
  - physicist & electronics eng./tech.







Optimization/Improvement — Performance

- Photocathode
  - Incremental improvement of existing “recipes”
  - Quantum efficiency of >40%? Via understanding of photocathode material science

- Microchannel plates see Michael Minot presentation
  - Smaller pore size – increased time & spatial resolution
  - Increased Open Area Ratio (OAR) – p.e. multiplication efficiency, 1st strike localization
  - Funneled pore opening – increased OAR, photocathode deposited on funnel?

- Atomic Layer Deposition (ALD)
  - Determination of optimized ALD physical/chemical parameters for baseline materials
  - Higher Secondary Electron Emission materials
  - Positive thermal coefficient for resistivity – thermal run-away prevention, higher rate capability

Optimization/Improvement — Performance (cont.)

- Anode Strip Line
  - Determine optimum pitch
  - Strip geometry optimization, i.e. width, material, thickness
  - # strips per tile
  - strip line analog band width

- Readout Improvements
  - Firstly --- Existing readout acceptable for many applications
  - deeper buffered ASIC – 256 sample buffer @ 10 GSa/s ⇒ 25 ns coverage
  - Increased analog bandwidth on chip see Gary Varner's presentation
  - Deadtimeless operation
  - Custom ASICs or FPGA for different applications
  - Increased # channels per control board? (reduce cost per chan.)

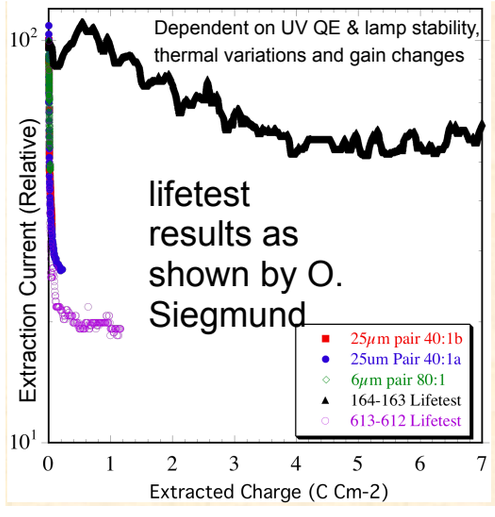
Optimization/Improvement — Cost

- Micro-capillary arrays (glass substrates) ibid ➛ Michael Minot
  - Finishing improvements (yield & performance)
  - Cleaning improvements (yield & performance)
  - larger pores, application dependent
- Atomic layer deposition process parameters, coating thickness,materials
  - Determine optimum thickness of SEE layers
  - Cheaper (and possibly better) ALD materials
    - MoF_6 ($26k/kg) vs. WF_6 ($800) better uniformity for lesser price
    - Al_2O_3 (TMA @ $200/100g) vs MgO ($6k/100g) better performance, higher cost
- Glass & ceramic body components
  - Optimize ceramic package fabrication
    - batch processing
  - Glass
- Readout
  - FPGA for low rate applications
- Fabrication methods – tiles
  - tubulation
  - Yield – learn by doing

see Jason McPhate presentation

Ultrasonic cleaning of MCA

+ 140 kHz



Community Support

- Program Goal — Several systems in hands of HEP community during Year 3
- Year 1 Devices
  - 8” tiles (ceramic and glass) from SSL during Year 1
    - First tiles will stay within Collaboration for evaluation and long term testing
- Year 2 Devices
  - Provide SSL Fabricated 8” Tiles & Systems to Very Early Adopters
    - Make available tiles/systems with integrated readout and existing analysis software
- Year 3 Devices – Systems to first adopters by end year 3

Community support from labs will be required for this aspect of the program